that the book makes its best contribution. This information permits the fullest possible use of the technique during the present early stage of development. The discussion of the technique's limitations and the comparisons with other techniques are most appreciated.

It is obvious that no single method of instrumental analysis is capable of solving all of the analyst's problems; however, atomic absorption spectrophotometry has much to offer, and this small book serves as a good introduction.

GEORGE H. MORRISON
Department of Chemistry,
Cornell University

Nuclear Physics

Physics of the Nucleus. M. A. Preston. Addison-Wesley, Reading, Mass., 1962. x + 661 pp. Illus. $15.

The author of this book, M. A. Preston, has attempted to navigate between the Scylla of elaborate theoretical detail and the Charybdis of descriptive superficiality. On the whole, he has been successful.

Preston's point of view is completely modern. A surprisingly small number of the references are dated prior to 1950, and the median date appears to be 1956 or 1957. These dates, of course, reflect the enormous progress that has been made in the field since 1950. Of the 19 chapters, five are concerned with matters that have arisen since 1950. These chapters are entitled "Individual particle model," "Correlations in nuclear matter," "Collective nuclear motion," "The optical model," and "Direct reactions." Further, three chapters deal with very old questions that have recently been developed afresh: the two chapters on the internucleon force and the chapter on beta radioactivity.

This very timeliness also gives rise to the book's major faults. On occasion Preston draws an unwarranted conclusion, because he is unaware of all the facts. One such instance, for example, which is subjectively of interest to me, is in the experimental curve for the proton-proton depolarization at 150 Mev. Later experiments, available while the book was in preparation, have shown that the data displayed at large angles are incorrect, completely altering the conclusion Preston gives on page 112. An occasional error of this type is no doubt a small price to pay for such an up-to-the-minute treatment.

I find myself in more serious disagreement with the author on matters of emphasis. For example, it is difficult to understand why the polarization of elastically scattered nucleons was dismissed with a single sentence on page 548. Many of the topics treated do not lend themselves readily to exposition at the level of theoretical sophistication that the author has assumed to be typical of his readers. In this connection, the chapter on the Brueckner method comes immediately to mind. The student who here encounters this material for the first time may emerge more confused than enlightened. On the other hand, it is difficult to suggest how a better treatment could be made at this level in the space allotted.

This book must be strongly recommended as the only book devoted to this material; thus, no serious student of nuclear physics can afford to be without it. Further, the book's own merits entitle it to recommendation, and my criticisms do not alter my basic judgment that this treatment is, all things considered, very good indeed.

R. M. THALER
Department of Physics,
Case Institute of Technology

A Hypothetical Model

Physics of the Solar Chromosphere. Richard N. Thomas and R. Grant Athay. Interscience (Wiley), New York, 1961. x + 422 pp. Illus. $15.50.

This monograph deals with a part of the solar atmosphere whose complexity has fascinated its investigators for almost a century. In the present era of widespread interest in radiative, magnetic, and mechanical phenomena at high temperatures, the title of this book will attract many students and nonastronomical scientists who seek a review discussion of physical processes in the chromosphere. These readers must be warned that writing such a review was not the intent of the authors.

The aim of this highly detailed research monograph is to infer, almost entirely from optical spectra, a structural model of the chromosphere (that is, a specification of the temperature and density at each height).

The authors, R. N. Thomas and R. Grant Athay, bring to this monograph the experience of years of collaborative study of the chromosphere. Most of the content has already appeared in the scientific literature. However, anyone who has tried to assemble, into a cohesive whole, the bits and pieces of journal articles whose publication dates extend over a decade, will appreciate the value of having all of the material assembled in one place, revised and corrected where necessary.

The authors have chosen to alternate in writing successive stages of the analysis, but this practice does not affect the continuity of their presentation. Thomas begins with an introductory discussion of the nature of stellar atmosphere, the particular problems of the solar chromosphere, and the validity of the concept of local thermodynamic equilibrium. Next, Athay reviews the spectroscopic data derived from eclipse measurements, and he describes mass motion and structural variation in the chromosphere. Thomas then sets down the equations that govern the level populations and radiative transport for the case of a statistically steady state. In this chapter (the fourth), he devotes considerable attention to terminology and the forms of the equations. These equations are the core of an "analytical methodology," which the authors employ throughout the remainder of the monograph.

Despite its emphasis on the development of a particular formalism, the treatment of deviations from thermodynamic equilibrium (in chapter 4) should interest anyone concerned with the spectroscopic properties of gases and plasmas. Few readers who are not specialists in the field of stellar atmospheres will wish to venture beyond this chapter.

The authors make little effort to interpret their conclusions in simple, readily understandable form. An occasional recapitulation, in relatively nontechnical language, would certainly have simplified the problem, even for the specialist.

The chromospheric model constructed seems a highly artificial one, based solely on chromospheric spectra obtained at total solar eclipses and mainly on a single eclipse—1952. Thus, the discussion is purely descriptive. The authors make no attempt to evaluate the physical processes that produce the solar chromosphere. A few references to "superthermic" processes (never clearly defined, but presumably shock

waves of some sort originating below the chromosphere) raise the reader's hopes for an exposition of hydromechanical excitation, the function of sound waves in the medium, the conduction of heat, and the like. But discussion never goes beyond the qualitative stage. Similarly, the corona is given short shrift in the text. This book deals solely with the chromosphere.

It seems unlikely that a discussion of the chromosphere alone, divorced from its surroundings, can lead to a unique model. Nevertheless, specialists will find the methods and conclusions of this remarkable monograph well worth study.

DONALD H. MENZEL
Harvard College Observatory, Harvard University

Oberling Memorial Volume

Ultrastructure in Biological Systems. vol. 1, *Tumors Induced by Viruses: Ultrastructural Studies.* Albert J. Dalton and Françoise Haguenau, Eds. Academic Press, New York, 1962. xi + 229 pp. Illus. $9.50.

This monograph, the first of a series on ultrastructure in biological systems, is most appropriately dedicated to the memory of the late Charles Oberling. The editors and the six contributors, who were all former students or personal friends of Oberling, conduct their investigations in four different countries.

The monograph is divided into seven major sections and is chiefly concerned with the following tumors, or with the agents that induce the tumors: the avian sarcoma-leukosis complex, contributed by Françoise Haguenau and J. W. Beard; infectious papillomatosis of rabbits (Shope), contributed by Karl-Hermann Hollmann; the Shope fibroma virus of rabbits, contributed by H. Febvre; the milk agent, contributed by Dan H. Moore; electron microscopy of polyoma virus, contributed by Robert R. Dourmashkin; ultrastructural studies on three different types of mouse leukemia, contributed by Etienne deHarven; and the Moloney agent, contributed by Albert J. Dalton.

The major sections represent individual and comprehensive review articles, each of which has a separate and full list of appropriate references. Each section is systematically divided into a considerable number of subsections, which are arranged in an orderly manner that makes it relatively easy to find a particular item. The reported facts and findings are presented in a concise and thorough manner, with appropriate critical comments. The great bulk of pertinent information relative to the tumors and the agents considered in the monograph is thus made available. An author index and a concise subject index are appended.

The editors have discharged their responsibilities in commendable fashion, for the several reviews form a coherent résumé. The monograph, which is printed on glazed paper, is well composed and easily read. The many figures, usually occupying an entire page, are of good quality and show well the fine structural details revealed by the electron microscope when specimen and instrument are manipulated by experts.

The monograph will be a valuable addition to the library of investigators who are interested in the tumors that are covered and in the agents that induce them.

FRANK L. HORSFALL, JR.
Sloan-Kettering Institute for Cancer Research, New York

Interdisciplinary Approach

Macromolecular Specificity and Biological Memory. Francis O. Schmitt, Ed. Massachusetts Institute of Technology Press, Cambridge, 1962. viii + 119 pp. $3.

This monograph is a summary of 25 lectures given at Massachusetts Institute of Technology in the spring of 1961 on the molecular basis for memory and recall. It is a splendid example of interdisciplinary cooperation, which is assuming increasing importance in the solution of major scientific problems. Some of the formidable difficulties posed by biological memory are analyzed by a wide spectrum of distinguished specialists, from mathematicians discussing relevant aspects of information theory to behavioral scientists primarily concerned with the mechanics of the learning process. But it is upon the natural scientists and the clinical investigators that the major burden falls. In a series of essentially speculative essays, the possible nature of biological memory is examined at the systemic, molecular, and submolecular levels. Substantial bibliographies greatly enhance the monograph's value.

The editor, Francis O. Schmitt, professor of biology at M.I.T., makes clear in his preface that the lectures were intended to be exploratory and provocative, rather than comprehensive. In this they succeed admirably well. But in certain other respects the monograph is disappointing. There is perhaps too much speculative emphasis on a memory storage function for nucleic acids. But this may be unavoidable in the light of recent advances in our knowledge of the genetic code. At the opposite extreme, no attempt is made to distinguish explicitly between information and meaning. In terms of macromolecular specificity and biological memory, information defined by the Wiener-Shannon equation and its corollaries is the only presently feasible path of quantitative analysis. Meaning, on the other hand, is a much more elusive concept. Symbol information can have many different meanings. Thus, the Gestalt concept, in which a whole is greater than the sum of its parts, may be involved in the definition of meaning. Finally, little of the illustrative material which must have been an essential part of the original lectures is included. This is particularly unfortunate in the case of intricate descriptions of brain structures.

On the whole, however, I believe this little book will prove to be most valuable to those interested in what will undoubtedly become one of the great scientific adventures of our time.

ELIE A. SHNEOUR
Radiation Laboratory, University of California, Berkeley

Notes

Statistics

The **Handbook of Statistical Tables** by D. B. Owen (Addison-Wesley, Reading, Mass., 1962. 592 pp. $12.50) is intended for students in advanced statistics courses and for both practicing applied and mathematical statisticians. The collection contains over 100 tables (or, when appropriate, graphs or nomograms) for the standard statistical functions as well as for many that are less familiar. Presumably it is intended for use with some table of standard mathematical functions, since not even the most necessary of these are included.